GROWING FALL-CROP IRISH POTATOES

By H. B. CORDNER

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V Series; No. 7

Experiment Station
Circular No. C-102
June, 1942

SUGGESTIONS

for Improving the Fall Potato Crop

Kind of Seed

Fully matured, Oklahoma grown, spring crop seed, stored at cellar temperatures, is preferable to seed from other sources.

Quick sprouting, early maturing varieties such as Warba and Triumph make better fall crops than the slower sprouting Cobblers.

Spring crop seed from states south of Oklahoma can be used if necessary.

Year-old seed, from the previous fall crop, might have an advantage in years when early frost shortens the growing season. It matures quicker, but produces a high proportion of small tubers.

Treatment of Seed

Allow spring-crop potatoes which are to be used as seed for a fall crop to mature as fully as possible before harvesting.

Store seed from the spring crop at ordinary cellar temperatures (70° to 80° F.)

Cut spring-grown seed immediately before planting. Freshly cut pieces sprout more quickly than whole tubers and hold up better at high temperatures than cut sets which have been allowed to stand until suberized. (Year-old or Southern seed planted as whole tubers will do as well as cut sets.)

Planting and Care of Crop

Plant the fall crop, if possible, at a time when the soil is cooled by recent rainfall (unless irrigation is used). Soil temperatures of 90° F. and above caused a marked reduction in plant stands, and consequently of yields.

The first week of August appears to be about the best time for planting the fall potato crop in the vicinity of Stillwater. Seed planted earlier is still dormant, takes longer to sprout, and is therefore more likely to be damaged by high soil temperatures. Seed planted later has less chance of making a crop before frost.

Low to moderate ridging is desirable. High ridges retard sprout emergence and let the soil dry out.

Straw mulch applied at planting time helps reduce soil temperature and conserve moisture, but may result in poorer stands if heavy rains follow planting.

Irrigation is helpful in reducing soil temperatures after planting and before plants are established, although an over wet soil (as when heavy rain follows irrigation) may be damaging.

Irrigation after the plants emerge stimulates the rapid growth needed to mature a crop before frost.

Overhead irrigation gives somewhat better results than furrow irrigation.

Growing Fall-Crop Irish Potatoes*

By H. B. CORDNER
Professor of Horticulture

INTRODUCTION

The large acreage of Irish potatoes grown each year in Oklahoma is planted as a spring crop and harvested in June or early July. Because it is difficult to keep potatoes at this season without refrigerated storage, the spring crop provides only a temporary supply for local consumption. As a result, potatoes are brought into the state from other producing centers during most of the year.

Many Oklahoma potato growers and gardeners plant a late or fall crop in an effort to supply local markets or to provide potatoes for the family larder during the winter, but these efforts are frequently unsuccessful.

Reasons for Failure of Fall Crop

At present, several methods are used in Oklahoma in starting the fall crop of potatoes, but the most common procedure is to plant back the small tubers graded out of the spring crop harvest. This is done shortly after the spring crop comes out, and frequently in the same field. It is a convenient and economical way of planting; but the results of these experiments indicate that it is not the most dependable method of getting a profitable fall crop.

The principal factors responsible for the widely varying results with fall potato crops in Oklahoma appear to be:

1. Low yields as a result of poor plant stands. Poor stands are in turn the result of decay of the seed pieces.

2. Unusually early frosts, which terminate the growing season before the tubers are big enough to make a profitable yield.

3. Lack of moisture, especially in the central and western parts of the state.

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* Data upon which the recommendations given in this publication are based is presented and discussed in Oklahoma Agricultural Experiment Station Bulletin B-258.

Goal of the Experiments

The problem of seed piece decay was recognized as of major importance. Laboratory studies in 1937 indicated that this decay was not due directly to plant disease organisms (as it is in the case of spring-planted seed), but to the high soil temperatures encountered at the time of planting the fall crop. Experimental results showed that a soil temperature of 90° F. is critical and that sustained temperatures of around 95° are entirely destructive to potato seed pieces. The injury caused by high soil temperature appears to be similar to blackhearting, and to arise in relation to a deficiency of oxygen. For some reason sprouted seed holds up better than does unsprouted seed.

Both laboratory and field studies indicated also that high soil temperatures are a hazard to the young potato sprouts as well as to the seed itself.

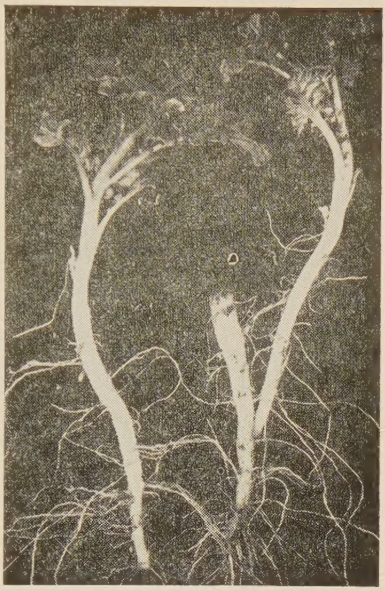
With the knowledge available from laboratory experiments as a guide, field tests were undertaken in 1938, 1939 and 1940. They were aimed at (1) securing rapid sprouting of the seed and (2) maintaining soil temperatures as low as possible. Solution of these problems, it was felt, would lead to methods giving reasonable assurance of a fall crop of Irish potatoes every year. Such methods are described briefly on pages 2 and 3, and in more detail in the remainder of this publication.

KIND OF SEED

Comparisons of results from planting different kinds of seed indicated that the most dependable yields came from seed of the Warba and Triumph varieties from the Oklahoma spring crop which had been allowed to mature as fully as possible and then kept in ordinary cellar storage until planting time. Where such seed was planted as cut sets, no special pre-sprouting or chemical treatment was needed.

Fully Mature Spring-grown Seed Make Best Stands

Field tests in 1938 indicated indirectly that spring-grown seed which was left in the ground until fully mature sprouted more rapidly when planted for a fall crop than did seed which was dug before fully ripened. Direct tests on this point were therefore made in 1940. The results showed that seed tubers harvested from the spring crop while immature (mid-June harvest) were slower to sprout when planted than were tubers which attained full maturity in the field (harvested July 1 to



High soil temperatures are injurious to potato sprout terminals. The picture at the right shows a sprout which was injured in the field, then later produced laterals which successfully emerged to establish the plant. The lower picture shows sprout injury produced when the tubers were planted at a controlled temperature of 95°.

July 6) and were therefore less desirable for seed purposes. This difference between immature and mature seed was most evident when whole tubers were planted. When cut sets were planted, the degree of maturity of the seed was not of great significance. (See page 10.)

Warba and Triumph Varieties Best

Varieties of potatoes such as Warba and Triumph appear to be best for fall crops because they have relatively short dormant periods, sprout fairly soon after planting, and mature comparatively early after emergence. Cobblers are about a week late in getting sprouts up, and mature more slowly after emerging. As between Warba and Triumph, the Triumph gets sprouts up a day or so ahead of the Warba, but the latter mature the crop more rapidly and therefore are more productive.

Southern-grown Seed Can Be Used

Potatoes grown in the more southern states and harvested some four to six weeks ahead of the Oklahoma spring crop have been tested several times as seed for the fall crop and have generally responded quite favorably. In contrast to the results with Oklahoma-grown seed, whole tubers gave a somewhat better yield than did cut sets in a test made in 1939.

Year-old (Fall) Seed Gives Early Maturity But Small Tubers

Tests of seed from the previous fall crop showed that it rapidly established a stand of plants in a high percentage of the hills and matured a crop about two weeks ahead of spring-grown seed. From a market standpoint, however, the ease of sprouting and rapid growth proved to be a disadvantage with year-old seed. Competition between the several plants which were established in each hill, and the early maturity, resulted in a high proportion of small tubers unfit for market, although the yield by total weight was about average. The rapid maturity of year-old seed might nevertheless be an advantage in years when early frost shortens the growing season.

Year-old seed, like southern-grown seed, did better when planted as whole tubers than when planted as cut sets.

Year-old seed (below) lacks apical dominance and therefore sends up several weak sprouts. Spring-grown seed after storage of 35 to 40 days has one eye dominant and therefore makes one strong sprout and produces a better yield. The plants from the year-old seed mature quicker, however, and might have an advantage in years of early frost.

TREATMENT OF SPRING-GROWN SEED

Normal Cellar Storage Preferable to Refrigeration

When tubers harvested in the spring crop are used for fall crop production, it appears to be desirable to hold them in storage for a time before planting. This gives the seed, which are dormant when harvested, time to "after-ripen" so they will sprout promptly when planted. The after-ripening process is affected by temperature and possibly by humidity.

In both laboratory and field tests of the effects of storage temperatures, cellar storage at 70° to 80° F. was found to be preferable to refrigerated storage at 50°. The lower temperature caused the seed to sprout more slowly after planting in the field.

A high storage temperature (90° F.) did not appreciably affect the rate of sprouting but was found undesirable because it favored shrinkage (weight loss) and decay in the tubers and a lower germination percentage resulted when such seed was planted.

Freshly Cut Sets Superior to Whole Tubers or Suberized Sets

That freshly cut sets are superior to whole tubers and also to suberized sets for fall plantings of potatoes was very clearly demonstrated in both field and laboratory studies. Comparisons of the different kinds of seed were included in most of the tests; and, except in a very few instances, the freshly cut sets sprouted more promptly and with a higher percentage of germination. Both these responses are highly desirable, first because the seed mortality at high temperatures increases as sprouting is delayed, and, second, because the earlier maturity which results is helpful in getting a crop before frost.

The reason that cut sets are preferable to whole tubers is that the cutting breaks the dormacy of the seed. This may also be accomplished by use of ethylene chlorhydrin; but, as is pointed out on page 12, such treatment appears to be unnecessary if seed is well matured.

The reason for the superiority of freshly cut sets over those which have been allowed to suberize is not quite so clear, but appears to be related to a more rapid absorption of oxygen by the freshly cut sets.

The improved stand of plants obtained from cut sets shows clearly in these four plots. The two at the left were planted with cut sets; the two at the right with whole tubers. Seed, both cut and whole, used in planting the two plots at the bottom was treated with ethylene chlorhydrin; seed for the two plots shown at the top was untreated.

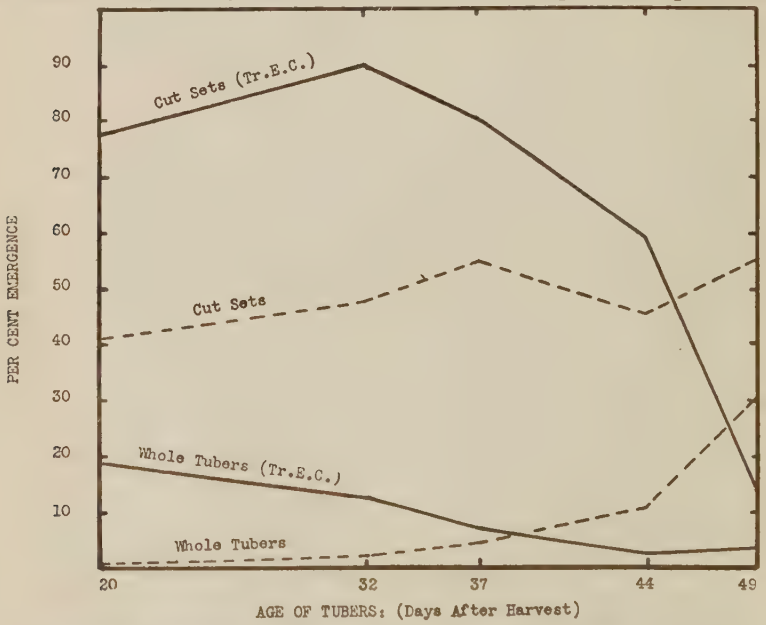
Whatever the reason, however, the clear superiority of the cut sets indicates that the practice of planting whole tubers is not conducive to securing the most profitable yields from fully matured, spring-grown seed.

Use of Ethylene Chlorhydrin Unnecessary

Study of the use of ethylene chlorhydrin to break the dormacy of spring-grown seed indicates that such treatment is unnecessary and may even be detrimental if the seed was fully matured when harvested and has been given a certain period of storage (See page 10). Ethylene chlorhydrin treatment may be useful, however, for seed which has had to be dug early to avoid damage by hot weather.

Pre-sprouted Seed Has No Special Advantage

Although rapid sprouting is needed for fall-crop potatoes, the use of spring-grown seed which was sprouted prior to



Chemical treatment of seed (with ethylene chlorhydrin) is unnecessary when tubers have been stored for a few weeks after harvest and are planted as cut sets. This graph shows results of a typical test. Note how the line for untreated cut sets rises above the line for treated cut sets after potatoes were in storage 44 days after harvest. This graph also shows the much higher percentage of plant stand for cut sets as compared to whole tubers, whether treated or untreated.

planting showed no special advantage as compared to cut sets from the spring crop. Pre-sprouting greatly improved the stand made by seed from the previous fall crop, but gave no advantage in marketable yield.

PLANTING AND CARE OF CROP

First Week of August Is Best Planting Date*

Time of planting was found to be one of the most important factors affecting the rate of sprouting and stand of plants, and therefore the final yield. In general, those plantings made during the first week in August were most successful and this is believed to be the most desirable planting date. Favorable soil conditions are more likely to be found at that time, and the spring crop of seed is by then aged sufficiently that prompt sprouting may be obtained by cutting alone and without the use of chemical treatment (See page 12). Plantings made the first week in August would normally have sufficient growing season to make a crop. Earlier plantings are likely to meet with more hazards in the way of high soil temperatures and lack of moisture, and would require chemical treatment of the seed to induce reasonably prompt sprouting.

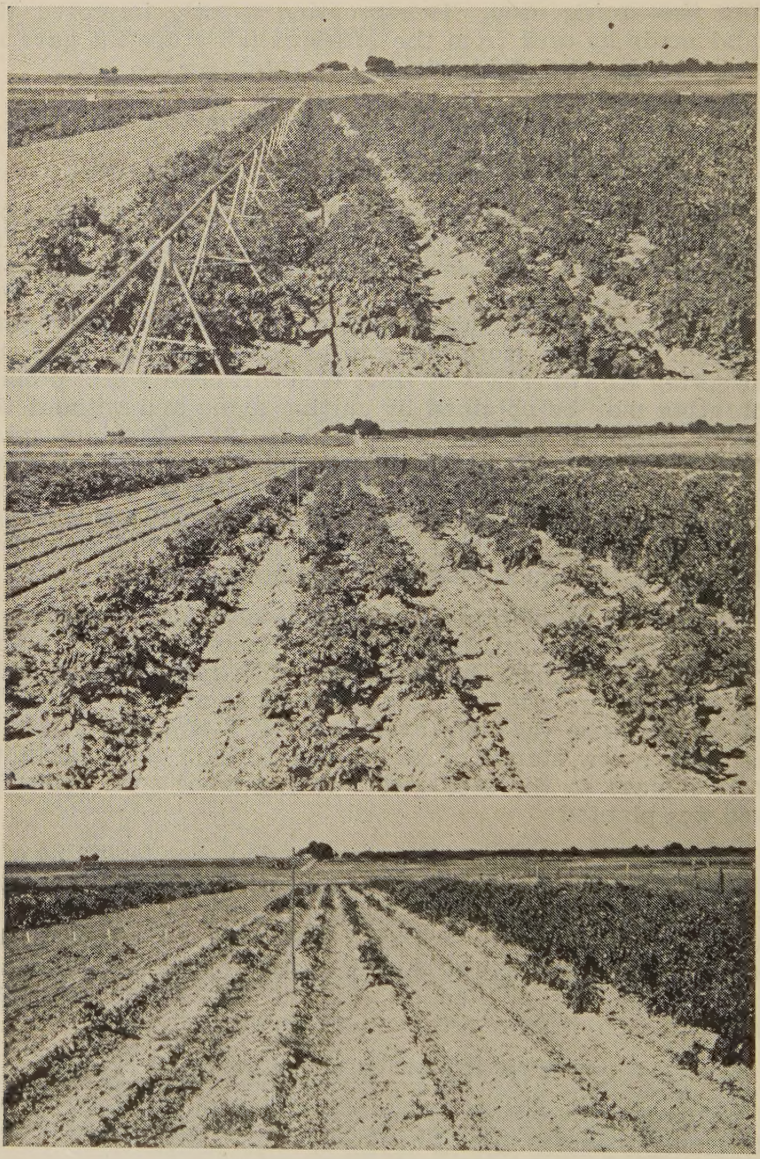
The date of planting needs to be adjusted somewhat to the particular season, however. The more successful plantings were those made in connection with rainy periods when soil temperature was low. Plantings made at times when the soil temperature was high (average of 90° F. and above) usually resulted in low stands of plants due to high seed mortality, with damage to the seed pieces taking place soon after the seed was planted.

Apparently when plantings are made under favorable conditions, the seed can later survive high soil temperatures which would be destructive to newly-planted seed. For example, in 1939, a planting made on July 8 just after a rain survived a period of high temperatures which came about July 15, while most of the sets planted on July 15, during the hot spell, perished.

High Ridges Unsatisfactory

Comparisons of low, moderate, and high ridges, and level cultivation, showed that high ridges are a definite handicap to the fall crop. They slowed up the emergence of the sprouts

* For vicinity of Stillwater.



General view of the irrigation test plots in 1940. Top, irrigated with overhead spray (Skinner line); center, irrigated by means of furrows; bottom, unirrigated.

and also resulted in more rapid drying out of the soil, with consequent reduction in yield. A moderate to low ridge gave more satisfactory results.

Straw Mulch Helpful in Dry Seasons

Tests of a straw mulch applied at planting time bore out the expectation that the value depended upon seasonal conditions, and especially upon rainfall. It was found helpful in one season when drouth and high temperature prevailed, and proved detrimental in another season when rainfall was heavy and temperatures lower. The effect was similar to irrigation applied between planting and sprout emergence (See below). Since, however, high soil temperatures are not unusual at planting time, it is logical to assume that the straw mulch would be practical in most seasons.

Irrigation Has Advantages

Because the two major objectives in producing a profitable fall crop of Irish potatoes are to have the soil as cool as possible at planting time, and to keep the crop growing as rapidly as possible, irrigation naturally is a helpful factor.

Experiments designed to find the best times for making water applications indicated that, when soil temperatures at planting time were high, an application immediately after planting aided in lowering the soil temperature and therefore in securing rapid germination and a good plant stand.*

Comparisons of the furrow and overhead (Skinner) methods of applying water were somewhat favorable to the latter, presumably because the overhead spray was more effective in lowering the soil temperature.

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* In one series in 1940, heavy showers and low soil temperatures came just after a planting which had been followed with immediate irrigation. With the soil in a water-logged condition for a time, plant stands were reduced, especially in the cut sets. The conditions for this one test were exceptional.

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